Interview with

Mike Haddad

By

Orville R. Butler, Ph.D.

At

Kennedy Space Center

June 27, 2004

Dr. Butler: Ok. This is Dr. Orville Butler and we're in the archives at Kennedy Space Center talking with Mike Haddad. I got the first name right.

Mr. Haddad: Yes sir.

Dr. Butler: And I, I guess I'd like you to start off by giving us a brief biographical background, where you grew up, went to school and sort of the events leading to your coming to to Kennedy.

Mike Haddad: Ok. I was born in Garfield Heights, Ohio. It's near Cleveland and lived there until I was nine, but then we moved down to Titusville, Florida in 1968. That was right in the heart of the Apollo program. So, they lived in Titusville up till just, well back in '96 I moved down to Cocoa Beach, but grew up in Titusville, went to high school, graduated from Titusville High school in 1976 and then went to the University of Central Florida for engineering, mechanical engineering. And then graduated from U, UCF in 1982 with a degree, actually with a dual degree at the time, mechanical engineering and aerospace. It was a combined degree from UCF. Um, while I was in school, they have a coop program at UCF that allows you to work a semester and then go to school a semester and then work a semester. So I was able to get on the coop program at UCF and get hired on at NASA Kennedy Space Center. Uh worked out here over in the Launch Control Center. The place over there, at the time was called the Complex Control Center. In essence it was the main room in the Launch Control Center that coordinated all the ground support equipment. It would support not only launch but any activities at the Space Center. You'll see, if you walk by the door here at headquarters or wherever, you'll see a sign that says this equipment operated by remote control. That's what our job was was to, from the central control center in the Launch

Control Center, was operating equipment all over the Space Center. Of course when it came time for launch we focused in on pad and facility operations that supported launch. Actually I was out here as a coop in 1981 for STS-1 working out there. Now, of course it was a very exciting time. When I went to graduate in '82 there was an opening at the Launch Control Center for the spot that I was cooping. But I heard about this new group that was being formed out here at Kennedy that was called Level IV Experiment Integration and I didn't understand what that was so actually called by cousin who was a coop in Level IV. He was also going to UCF in engineering and he was a number of years behind me and he was cooping in the Level IV Experiment Integration Group where he cooped and he said hey we were looking for new engineers over here. Him being there me wanting to go, maybe do something a little different. I got an interview and went actually at the time there was a hiring freeze on here at Kennedy. And so I got picked up in what was called an engineering pool where you'd go and ninety days, you'd spend ninety days in this group and then you'd transfer to a different group at the Space Center. And they sort of moved you around until they could either find, get a permanent spot for you or whatever. And so when I graduated in 1982 I came out to work Level IV Experiment Integration here in the, it was actually located in the Operations and Checkout building. And after about thirty days of it they wanted me to stay and I wanted to stay and so at that point I got on permanently as a permanent mechanical structures fluid engineer working Level IV Experiment Integration.

Dr. Butler: OK and what does Level IV Experiment Integration do?

Mr. Haddad: Ok, that was for, that was a very interesting, that was a very interesting group that we had. Um the concept was and it was, it was a very unique group in that the engineers that worked there were NASA engineers and instead of, like most places where you have a contractor engineer that you oversaw with a contractor technician, there was no contractor engineering. We as NASA engineers would do the work that a contractor engineer would do in pretty much through out the rest of the Space Center. Um just having a contractor technician support. We had NASA Safety and NASA Quality, but we were the engineer. So it was, it was a new idea, a new concept that they sold, that people here at Kennedy sold to NASA headquarters. Initially um I guess the concept was supposed to be handled off site—Marshall, Johnson Space Center—but the team here that came up with the idea, said that we really need to focus in one location, that location should be Kennedy Space Center because that's in essence where the rubber would meet the road before launch. We thought if all the pieces would come in here then all the integration work should be done here at Kennedy. What that group did pretty much was support anything that was payload wise that flew on the Space Shuttle. So there was a whole Space Shuttle organization gearing up to get Shuttle ready for launch. There was us in the payload group and specifically us—myself and a number of other engineers in level IV—which was, NASA hands, it was called NASA hands on—that was getting the payloads cranked up to support the mission where the Shuttle and the payloads come together for the flight. So when we were. We literally did everything. We reviewed the design concept. A number of us would fly literally all over the world to wherever the experiment was that was supposed to fly on the Shuttle. And this could be experiments that were a mid-deck experiment, a small mid-deck fit in a mid-deck locker, or it could be as large as the space lab program missions that would fly seventy, eighty experiments in a pressurized container that went in the cargo bay of the

Shuttle. So there's this whole gamut and we looked at all of them. We looked at international; we were involved international aspect early on for space lab I. And so we would literally be involved cradle to grave. We would go to the design centers. We actually participate in some of the concept phase of what the experiments would be. Some of the experiments were already so far along that we'd get involved in either critical design review or preliminary design review. Uh, we would look at that with us and of course as we flew more missions we got more familiar with things we need to do here, problems we ran into and we would in essence we would solve the problems ourselves. We would be the ones that it was our responsibility to get that experiment, to get that set of experiments to get that mission payload ready for launch. It was all on our necks. And we were all, a bunch of us right out of college, it was a bunch of young guys working with experienced Quality and Safety people who had been here for a number of years and a very um young technical or uh technician corp. So there's this young group of people trying to do something that had never been done before. They had done it back in in the Apollo days, that's how NASA began, so this was a revitalization, but it was the first time they tried to do it in Shuttle program of course. And so we would participate and remember that we would review the drawings. We, I mean myself; I would write hundreds of procedures myself from those drawings that I reviewed. And I would do the work. And we had been trained into the exact same training the technicians would do. At the time we had about the same number of technicians and engineers. Well, for the crane ops for example, you would have four or five maybe technicians with one engineer doing the crane ops. So what happens to the other engineers now that half, half of your engine, half of your tech, technical, your technician corps is working on the crane ops?

Well we literally, and I myself literally would torque the bolts. I would have the wrench; I would have the procedure I wrote; the Quality man would be reviewing it and I would be sitting there torquing the bolts, or assembling the hardware or pushing the button literally myself. There was nobody else. And so it was really unique in that we had NASA people doing that function here at Kennedy Space Center. And that worked for a number of years working mission after mission down here. Space Lab, TDRS satellite, the Astro, Astro series of missions, the Atlas series of missions, of course all the Spacelab, Spacelab 1, 2, 3, the international Spacelab which was D1, German Spacelab 1, German Spacelab D2, the Japanese mission—Spacelab J. We were the people that were responsible pretty much for taking the experiments and getting to an operational flight level. Now a lot of the time we didn't design them but we helped design them or we helped change the design of them. Because again these, and again some of these scientists had been working on this one experiment for maybe a decade or longer to fly in the Shuttle for this one seven, ten, fourteen day mission. So they knew that experiment like the back of their hand. Our job was to get that one experiment they focused in on, they knew the guts of; integrating that into the other seventy experiments that were going to fly on say that mission for example. So we would have to understand what that experiment entailed, what that was needed to do, what its interfaces were with the rest of the hardware. And because again as more missions and more missions flew we got more of a knowledge base of problems we ran into, how the subsystems worked, how these experiments were interacting, would interact together, how the integration effort would work, the timeline of how much time we spent for this experiment compared to that experiment; power allocation, resource allocation. You know we had to coordinate all that as far as coming together here at Kennedy. Like we would have to say, ok, we need the experiment here on this date because its going to take, we estimate its going to take three weeks to integrate that into the system, another two weeks to test it. So we'd have to integrate the system it's going to go into, we'd have to integrate the resources to ship that hardware here, any support for our clients, if they needed special gas, if they needed any kind of special testing, if they needed the final assembly work, if they needed special contamination conditions. We had to handle all that, so that experiment then would come in, we would do what we needed to do and get it integrated into the flight hardware. Now that was tough for some of these scientists to just turn their baby over to these young kids, but that was our job. Our job here at Kennedy was to take that hardware once it came through the gates. There's actually a sequence what was called offline and online. Offline was where the hardware would arrive here but the scientist experimenter; they would still be doing the work on that item. A lot of times there was some last minute things that had to be done that the experimenter would do. Ok, that's offline work. We'd support that but it was still the experimenter's job. When it came online it became our responsibility so the transition of the responsibility came from the experimenter to us. It was on our necks from then on. And a lot of times the scientists' had problems. Now they wouldn't go home, they would be right next to us, but it was our responsibility coordinating with them. It was tough because they had been spending a decade or more on some of this hardware turning it over to young kids, they didn't like that idea, but it was our job to do that.

Dr. Butler: Why don't you give us, take, take one particular example?

Mr. Haddad: Ok

Dr. Butler: And track it through from conception to liftoff.

Mr. Haddad: Ok. Uh one of them I worked on was, the mission was called Large Format Camera Orbiter Refueling System. What it was, it was a payload that flew on a structure, it was a smaller structure which was called an M-pack, it was a bridge type, it would stay on a bridge in the cargo bay of the Shuttle. It was a smaller structure. It was only about 27 inches wide that would span the length of the Shuttle cargo bay. And it was used to fly smaller complements things, you wouldn't need a large, a large carrier, you could use it on a small. So I was responsible for the Large Format Camera Mission. At the time it was the 41B mission which was going to fly. What that was entailed was a large camera, literally a camera, that had a regular role of film in it. Now this role of film; the negative itself was seventeen inches by nine inches, one negative was that size and it was a four thousand foot role of film that was in this camera. Well this camera had been used before on the ground and in aircraft but they wanted to fly it on the Shuttle and it took high resolution images of the earth. So I got involved early on, how would we assemble, how would this camera come in for example? Try to understand how the camera worked, for one thing, and then how that camera was going to be coming to Kennedy Space Center. I would go to meetings, it was a camera that was coming out of Houston—JSC Houston. So I would go to Houston for a lot of the reviews. What is this camera's function? What is it supposed to do? Ok, it's supposed to fly on this carrier. How is it going to be integrated? Is it going to be in its own little structure? Is it going to be a unique structure? Does it bolt right to the existing structure? The interfaces—what kind of electrical? Data? Does it need any gasses? Those are the kind of questions that I asked early on. And I found out that yes it required gas for the camera, it required this type of electronic inter, interference, inter, interaction. It had a unique support structure. So we had this basic structure that was already there that was flying many times and we had to bolt on this unique structure that the camera then would go on. Ok, now I need to know, I need to review the drawings. So I would review the drawings of that special structure that had to be bolted on and then I would review the drawings of how that camera got mounted to that special structure. And then the interfaces, the cabling, the fluid lines, anything else that may need to be connected. So I reviewed all that and again it was a combination of the structure, the basic structure, the unique structure and then the camera. I decided to take all those drawings and sit down literally with those drawings spread out over about three or four desks and then ok Mike, how are you going to put this thing? How are you going to assemble and test it? And that was my job. My job was to write the procedures that would take this basic structure, put it somewhere down in the Operations and Checkout building; we'd have to figure out where we could put that physically, to be able to get the cranes and whatever else I needed to to be able to work on it. So that was the first thing, where is it going to go? So I figured out ok its going to go, the basic structure's going to go here. The unique support structure would come in then. Now I had to time that in because there was a number of cabling and electronic boxes that I had to mount first to the, to this basic structure before this unique structure came in. So I had to plan all that out. So then I had to figure out how I'd write procedures for the cabling. I had to write procedures for the electronic boxes. How would I integrate it initially and then timing for the unique structure came in, bolt it in. And then when the unique experiment came in—this Large Format Camera. So I did all that. I created those procedures and had to time, again over the course of a year, time when that hardware would arrive at Kennedy Space Center to then all be integrated into one flight experiment that then would be tested here to see if everything would work integrated together. So that's just getting the pieces here and getting it assembled. And once that happened—that would all happen in the Operations and Checkout building—a lot of times people felt well that's were our job ended, well it didn't because that step, that would then be integrated into another mission package that would actually fly in the Shuttle. You see there were actually two components that flew in the Shuttle; mine in the back and this one in the middle of the cargo bay of the Shuttle. So when we got through with integrated testing and assembling the thing was pretty much all assembled and tested out here and it ran, we ran into a lot of problems on how it would work initially. Some of the fluid lines didn't integrate well, the cabling was a lot bigger and thicker than we thought so trying to get bending radiuses and all that. It was, it was a nightmare, but that was our job. Our job was to take what was on the drawing and make it operational, assemble and test it and get it ready for flight. So the Large Format Camera that was just one mission that I did. Once it was all assembled and tested it would go out to the orbiter. Now for this mission we actually got integrated at the launch pad, so we got installed at the launch pad. But we followed it all the way through launch pad, all the way up through integration into the Shuttle, to the testing with the Shuttle. We followed all of that. And then once it's launched we were in Launch Control Center to support the launch. Any unique activity had to be done prelaunch before we launch, we were at the console in the firing room because we had spent, well sometimes a year or two years with this hardware getting it ready. So we knew it as good as the experimenters knew it. And so we would support for launch, um, a number of us would get sent out to wherever for a mission. For example for this, there was something happening on orbit, we would go, now for the Large Format Camera I didn't support the mission directly, I was here at Kennedy, but I didn't go out to Houston. But a number of other times we would. We would go out, and we even had people travel overseas to support the mission because we had spent so much time with this hardware, we knew it, so if there was a problem on orbit, even though it was someone else's responsibility, we knew that hardware the best and so we would be there to support the mission operations and to solve any problems that may come up or anticipate the problems.. And of course post flight it was just the opposite. We would be there immediately after landing and we would do all the deintegration from the orb, from the orbiter. The Large Format Camera went out to the OPF. There was another package that flew on it called the Orbiter Refueling System which actually had hydrogen in it and I was responsible for that too. Well post flight, we needed to safe that after the mission. So we would go into the OPF literally after they opened the door, right after they opened the doors to safe that equipment out of the integration removal of the main piece from the Shuttle and then the components from it. So we would do the integration, mission support, deintegration until that camera literally went back to Houston. I was there from cradle to grave, doing it all. And that was just one mission. Um at one point, and I remember I talked about this before with other people, in 1985; I was working on thirteen different missions at the same time. So one aspect or the other, whether it was design, whether it was integration whether it was deintegration, whether it was servicing, whether I was working at the pad, whether I was supporting launch, there was thirteen of those I was working at one time. And again this is hands on, we did the procedures, we did, we solved the problems, we wrote the disposition on the problems, if it required any hardware, we modified the flight hardware if we needed to. We did whatever we had to do to get that hardware ready for launch. And it was a really neat time. A number of the Spacelab missions that flew were supported pretty much done by this Level IV Experiment Integration Group, the experiment component of, of those payloads. Again we worked for, I was, I was in level IV for almost seven years, working, working those missions and it was the most rewarding time for me at Kennedy Space Center. Because again we did everything.

Dr. Butler: It had to be from about '82 to '89.

Mr. Haddad: Yes it did

Dr. Butler: Now what relationship did Level IV have to do with John Conway's cargo group?

Mr. Haddad: We worked for John Conway.

Dr. Butler: OK

Mr. Haddad: And in the Level IV group was one division under his whole Directorate of Cargo. I think he had ELV payloads and then he had what was called Spacelab which was the basic core Spacelab system, not the experiments and then there was all of us in Experiment Integration. So we worked under John Conway, he was our director. Actually there was another gentleman; I think it was Wiley Williams, his deputy or something I can't recall. But he was actually there before John Conway. We were under John Conway

Dr. Butler: Yeah, John Conway comes in in 1985.

Mr. Haddad: Yes.

Dr. Butler: Uh, Conway says that when he came in he was told the people, the customers were unhappy with Cargo and that things needed to be changed. Do you remember anything about the changes that he implemented?

Mr. Haddad: I think what had happened was. I know they were unhappy because a lot of times they wouldn't understand what had to happen at Kennedy until they got here or just before they got here. And so at that time they would "Oh, gee, we thought this was the case and now we come to Kennedy and realize that's not the case." One of the things that John incorporated, I'm pretty sure it was around that time frame, was getting us involved earlier in, with the experiments. Say OK give them a real heads up early on about what happens at Kennedy Space Center; don't wait until a month before they arrive. Go there a year; go there during their design phase, their concept phase, their review phase. Get involved earlier with the customer to help, help smooth that transition from there because they, they would be in a research environment, even other centers—Goddard, Marshall Space Flight Center, Johnson Space Flight Center, Ames—they had their own unique way of doing it. Well when they came to Kennedy there was a Kennedy process established and I think John helped maybe getting us early to help smooth out that transition because, here at Kennedy because we had experiments coming in from literally all these centers, universities domestically and we had internationals; we had the Germans, we had the Japanese, we had the Italians, we had pretty much anybody throughout the world coming in and they had all their own unique systems. Well instead of us being out there trying to conform to twenty different systems we pretty much said well when you come to Kennedy here's the KSC system. So please try to transition from your system to Kennedy's because we can't operate in twenty different modes. We need to operate in our mode because there is so many people coming in from all different directions, we couldn't operate in twenty different modes, we couldn't do our jobs. And so I think he'd helped smooth that transition by getting us involved earlier, saying "This is what you need to expect at Kennedy." "Oh, ok, now I know. It's a year away I can adjust. I can compensate. I can be ready now instead of a month before I'm here, oh geez, I can't do that at Kennedy? Why didn't you tell me a year ago when I was designing this hardware? Why do you wait until it's already designed and ready to go?" And then what happened was well geez, it would get here and then we would scramble to fix whatever had to be done—write waivers. So I think John helped with that. He understood that we had to get involved earlier. And so he helped with that customer interface that yeah, they, they were unhappy because they a lot of times wouldn't hear things or just the details, because we, we were the ones working on it and we didn't see them until late, the interaction that was important, the details we knew that maybe other people didn't, didn't get transmitted in that. So the ball got dropped. I'm not saying it was anybody's fault

Dr. Butler. Hm hm.

Mr. Haddad: but just literally the work that needed to be done to pull it off not all the details were there and when you got that was the things that fit. The little guys, believe it or not, the nuts and bolts little pieces, that's what really did it, and that's what this interaction helped solve ahead of time. And that's just talking from a mechanical standpoint; of course the electrical side had all their own software and electrical problems just like we did on the mechanical side. So it was, it was a fun time and then of course after Challenger, we were here for Challenger. Um we were sort of in a hold mode, because we were cranking out missions. We had, we were really flat out. I mean, I remember sixty hour weeks were nothing. We would work twelve, sixteen hour days seven days a week for months, because it's just a hard place to get to, so we worked that hard to get it ready for the mission. And we loved it, I mean for us we were college kids so we'd go flat out, it didn't matter to us. We loved our jobs, we lived our jobs, all our friends, all my close friends were the people I worked with here at the Space Center because we would spend twelve hours at work and then we'd go have dinner and spend the next five, six hours talking about our problems and helping anybody, have each of us help each other solve the problems cause everybody was in the same boat. Everybody had a problem to solve and whatever we could do to help the other guy was good because you knew eventually he was going to have to come help you on something that maybe you couldn't figure out. So they were my closest friends, yeah, and their still my closest friends, the people that I work with here at the Space Center. But after Challenger we were down time and we tried to figure out what we were going to do. Were we going to continue flying these missions or were they going to cancel these missions and have to deintegrate them and so for a period for a number of years there we were sort of in a hold mode and so we shifted our, our activities towards the ground support equipment, the things we would need to support whenever we'd start flying again. So we stayed busy but it was more on ground support equipment side then on the flight hardware side until they figured out what we were going to fly again and then we cranked up that machine again following the return to flight. It was a very interesting time. And we tried to bring people in, got new people; some people would leave because it was so intense you definitely got burnout. And some people would leave and we would bring new people in and so we would replenish our little program—NASA hands on engineering, because again we literally would do everything. The technicians were were busy or they were off supporting other activities. We turned the bolts; we pushed the buttons, ourselves. So it was fun, but it wore me out after a number of years of doing that. But we had fun.

Dr. Butler: Now this this year, 1986, we have Challenger happen at the beginning of the year. The day after Challenger, now this is a little bit higher level than, than your dealing with, the day after the Challenger happened was supposed to be the day that a contract proposal went out for industry review—called the Payload Ground Operations Contract.

Mr. Haddad: Hm hm.

Dr. Butler: And of course that gets put, put on hold for a little while as a result of Challenger as well. But by the end of the year the Payload Ground Operations Contract has, has been approved and awarded. And the beginning of January, January 1987 McDonnell Douglas comes on board as as the contractor.

Mr. Haddad: Hm hm.

Dr. Butler: How did that affect what you're doing?

Mr. Haddad: it was, it was, it it it, probably was a big change, because some of the people we worked with for all these years now weren't picked up by private contractors. And the way the contract had had been structured to do certain things, I mean I wasn't that detailed on all up on what the contract said. We tried to proceed on like we did before because it was so successful. And we did run into some things that maybe weren't like it was supposed to—like we had it early on. So it affected us in that we had to change the way we done business—not a, not a total change, but it was a change. And so then we had to regroup and say ok this is what we done before. How do we accomplish that same kind of task now, using a contractor with maybe different technicians with a different management structure over those technicians, with a different interaction maybe between us and the technicians, or eventually I guess would be the engineers that were brought in. Because there were some engineers that were brought in that supported, pretty much did what we did. They were the transition to where um it wasn't really enough NASA people so we had brought in McDonnell Douglas contractors to work the level IV engineering activity. I had, I was leaving by then, I was starting to leave to go on to other payload activities.

Dr. Butler: So so during this, as that contract comes on do you begin to see a diminution of of NASA level engineering and being replaced by contractor engineering?

Mr. Haddad: Yes sir. Yeah that was, that was one thing that I had noticed. Whether it was true or not, you know, you know I'm sure everybody has their, their own opinion about whether that was true. But I saw that as being, and it wasn't a, wasn't a bad thing but if it was implemented right. But yeah I saw where we were, we were actually getting. It was being. There was that idea of getting NASA out of it more and more and bringing back the contractor being like it was everywhere else. And there was more of a push for that. One of the things that during that time frame, I actually got assigned to a task group that was called Task Group 1A out of NASA headquarters. It was headed up by NASA's Sally Ride the Astronaut. Um, because at that time there was somebody that came down and asked me about NASA's involvement in space, you know, how much should NASA be involved and how much should the contractor be involved.

And I was honest with them cause I'd been working level IV for years up to that point. I told them I says "I think that NASA should do it all." I said we, you know, we, this was from the experiment side, point, point of view, I said we should do all the stuff, because we've been doing it and its been very successful and I think NASA should continue to do that. I don't think NASA should be taken out of that role doing the hands on experiment integration part of it. Maybe other things NASA could be taken out of but the detail on the floor turn the bolts, push the buttons that NASA should continue to do that because it has been so successful. Because I was so outspoken, they, they picked me to be the KSC rep for that group. Because the Task Group 1A, in essence it was a group formed by the administrator, Dr. Fletcher at the time, to come up with NASA strategic plans for the future and because of my opinion sort of caught their eye and this is somebody that would probably be helpful in determining what maybe a strategic plan for NASA for the future. So I got picked as the sole KSC's sole rep to go on it. There was a representative from each Center and I was the KSC rep on that team. So because I saw that transition I thought and I was outspoken and got picked by that team. But I did see where we were getting sort of phased out and good or bad, I, for my opinion I didn't think that was the best. I'm not saying that the people coming in were bad, I'm not saying that they could do the work but I thought we should still. I mean they were good people that were coming. I mean they were really bright engineers but I just thought that we should do it. So that was my contribution.

Dr. Butler: Now when, when was this board?

Mr. Haddad: I was picked in, it was 1986. It sort of came out of the results of the Challenger accident from the standpoint of it was a plan for NASA. It was called Strategic Group 1A and it got headed up by Dr. Sally Ride. In essence we, part of what we worked on was in the Sally Ride report. It was released in, I think it was '89. I don't remember right now. But our our job was, was to develop a strategic plan for NASA. And we did that.

Dr. Butler: And what do you recall were the fundamental recommendations that that this group put forth.

Mr. Haddad: We had, we'd come up with an idea of we saw in the past how we were sort of we'd start and stop, start and stop. You know we'd go Mercury, Apollo or Gemini, Apollo and then we stopped. And then we went to the Shuttle and it wasn't, there didn't seem to be a long term strategic, strategic idea. What we were really trying to do, so like we'd go for now and then we'd say ok, and then we'd jump on the next program and then we'd jump over here, and so one of the things that we worked on was a long range strategic plan, in essence building the infrastructure to come up with how would we, the bottom line was exploration of the solar system. Ok, I mean this is way out there. But that was, you know we were really looking at the long term, decades, centuries even. Where would we want to be? We were going to talk about flying humans to the next star. How would we get there? And so we came up with the basic infrastructure. You'd have to establish basic, you know, think of it as like the wild wild west. You know, when people would head out west. You would have to establish certain infrastructures; you would have to establish communications, food, basic stuff. You would have to have the ability to move on to the next step move out a little further west. Of course all the problems that were associated with doing that, we'd have to, we tried to apply that to space. And of course here we have oxygen and all that. You know that was another big problem; you can't go into space if you don't have oxygen. But, that was our goal was to try and simulate that, you know, we can't take everything with us. Like the pioneers of the old west when you go to Mars, we can't, can't take everything with us. It's just not feasible. You have to eventually start living off the land. And so our idea was how do you do that. Everybody says yeah you can live off the land. We need to go, you know, to the moon, to Jupiter, to Saturn, for people, but how do you do that. That is what we did. We, because we were one person from each center it gave gave us the over all NASA look of the research, the design and the operations, you know, the ground processing. You know, how would you do, how would you launch stuff from the surface of Mars? Well at Kennedy our experience is in launching stuff from the surface of Earth. So we had the expertise at the Center that now we could apply to the concept of launching people from the surface of Mars, another planet. So that was our, that was like our Kennedy aspect, there was JSC flight operations, there was Ames research, you know, there was Marshall design, Glenn, Goddard, all those, Langley and so we're all different. All the centers coming together we had, you know, a whole gamut of things we needed to do. The research guys would say we'll use research, operationally how do you pull that off? We would come in operationally and say how we would accomplish what you guys had said maybe you'd wanted to do. So that is what we, the group, would come up with and if again you look in Sally Ride's report it was really a lot of that is in there of ours using a building block, and this sounds really simple but it's a building block infrastructure on how proceed to eventually send humans to the stars.

Dr. Butler: Did you have any of the debates that had gone on within NASA and external to NASA over manned versus robotic exploration?

Mr. Haddad: Yes, we sure did. That was a big one. That was a big one was, um, and we looked at it more, instead of man versus machine as man and machine, oh, person, human and machine because in the process we were using and I think we're using today you have to end robotics first. The bottom line is that you have to understand where you're going. Of course in the wild wild west didn't have that. The people went but we, we thought that robots had to go first. The bottom line was that you had to understand where you're going, what's there, before you send people. And so our concept was a whole series of robotics that started out with back to the moon, planetaries, Mars, different planets and of course some of those have already occurred, you've got the Mars stuff that is going on now, the Rovers that was part of it. Send the Rovers first to get a feeling of what the surface was like. Cassini now at Saturn and of course Galileo was at Jupiter. Those were initial missions that of course you have to follow up with a lot more detail depending on what you'd want to do, but we saw robotics being first, absolutely, to get the information. Again like what they did with, you know, the Mars Rovers are a perfect example. You send up a spacecraft initially. You try to do a landing but at least you've got an orbiter and you figure out where's the best place to land using the orbiter. After you send, you know you send some course Vikings and Pathfinder down first. And then from there you build upon what the robots have found out initially but you have to file all this, on orbit and the few things you have on surface, where the best place to put the next set, and that's the bigger robots and then eventually people. And so that's pretty much what JPL, because we had JPL as part of this group too that they're, that they're using. In fact the gentleman that was part of our Task Group 1A, he was, he was the Director, Program Director for the Pathfinder, flying mission Skip Newfeld [phonetic].

He was the Task Group 1A JPL man. And so I think that was sort of all in the back of our minds, but of course he was able to implement it. So we see the robots definitely as being precursors for, for the people. We see that, you know, we saw that the people could do it. There were things that the machines could do but were limited and we knew that eventually we would have to send people so to do, to do a really in depth, because there's ways that, the way we were asking it, in a just real time that you couldn't do with a robot even. Even robotically, even using remote communications you can't, it's getting better but we still feel that, at that time that eventually humans will have to go to Mars and send them to, maybe the outer planets eventually or sent them to the stars. And how do you do it, you have a robot first. So yeah, it was a mix; it wasn't us or them, it was more a human and machine versus a human versus machine. You needed, you needed the machines to get where you want to go. That's, that's the tack we took.

Dr. Butler: So it was more a matter of what ratio that you use and and when do you bring in the humans instead of one or the other.

Mr. Haddad: Right, depending on what you learned from the robots determines whether we can go to Mars in the next ten years or twenty years and of course the technology to support that. We have a big gap there. Of course you can go to the stars but if your still using chemical engines, it will take you centuries, you know, eons to get there. So it was all based on the technologies that eventually would come as well. You have robotic stuff that would be, would teach you about where you're going to go and then the new technology that would get the robots there faster better bigger and of course how that would feed in to getting the people there because to send the robots easy um from the standpoint, well not really easy but its easier than human of course because the infrastructure to support a human mission, of course, is a lot more elaborate than for robots. Maybe easy is not the right word because its not easy doing it with robots, its very difficult with robots, it's just the logistics, I think, is less with robots than with humans. Did I answer?

Dr. Butler: Hm hm. Let's return back to payloads in Kennedy.

Mr. Haddad: Ok

Dr. Butler: Uh, you were getting out of Level IV. Where were you heading to?

Mr. Haddad: Well, I wanted to do something a little different, but I wanted to stay involved with payloads, and so I got involved in more elaborate payloads. Instead of just experiments I got involved with missions like the Ulysses mission, it was a mission that's still out there flying around the sun. I got involved in the Galileo mission which of course went to Jupiter. Um, was involved in the Magellan mission that went to Venus. I got more involved instead of just the science experiments that flew in the Shuttle; it was the observatories. I wanted to work with Hubble. I wanted to work the UARK (?) mission which was the the, the compton ga, the Compton observatory and I worked the, it was called GRO at the time, it was an observatory. So I went from the experiments to the planetary type payloads, the observation type payloads, a couple of those, and also the satellites, the communications satellites, Syncom, some of the other satellites. So I wanted I wanted to get the variety of payloads that at that time were flying on the Shuttle. I didn't want to just stick with experiments. I was actually getting fried after seven years. I was looking to stay involved in that type of work, but more of other types of things as well. I got involved in more mid-deck experiments that flew. So that was why I transitioned from experiments to the planetaries, to observations and to satellites that were payloads on the Shuttle as well. I got involved in the Shuttle Centaur booster that was supposed to be on the Shuttle as well.

Dr. Butler: Ok. That's to a direction I was wanting to go here. Many of these, particularly the interplanetary missions had originally been scheduled to be sent on their way by Centaur.

Mr. Haddad: Hm hm.

Dr. Butler: And then after, after uh Challenger the Centaur program gets cancelled. Can you tell us a little bit, first of all about your, your involvement with Centaur and what you did there and and then how payload had to deal with the transition from Centaur to the alternative Interim Upper Stages.

Mr. Haddad: Ok, ok, sure that's um. After Challenger we actually got, that was one of the projects that I worked on while we were getting ready for return to flight. I went over to work and I'd actually started to work on it a little bit already but it was physically over at the launch complex 36, at the pad there and I was involved at the time I got when I transferred over to these other type payloads, I got into working propellants was my specialty—hypergol propellants specifically but worked bi-prop and other type propellants. Well, of course Centaur had, it was a bi-prop. And so I was involved in, because of my background working experiments, because of my background working some of these other things I got, when I transferred over, I got to work in the uh assemblies and reintegration of the Centaur booster.

Dr. Butler: Ok, before we go on, explain to us what you mean by bi-prop.

Mr. Haddad: A bi-prop is liquid hydrogen and liquid oxygen. It, It's.

Dr. Butler: Two propellants.

Mr. Haddad: Two propellants that you had to initiate a detonation for example. Um. There are different classifications of propellants. You have hypergols which in essence means as soon as you mix them, you don't need a spark or anything. Just by mixing them they detonate, they explode. So you had that type of propellant that I worked on and then you also had bi-prop propellants, bi-propellants, which was liquid hydrogen, liquid oxygen, kerosene type fuel that you would have to mix and then you would either cause a spark or you would have something you initiate to get the explosion that you would then use the propellant. And so with it being a bi-prop, I had worked on liquid hydrogen, liquid oxygen systems as well and so this was an element that had those both components of it. And so our job was to pretty much get Centaur ready for launch. Um and because I had worked with experiments, because I had worked fluid structures I'd become an expert in propellants, we focused on getting Centaur ready.

Dr. Butler: Now this was getting Centaur ready for, for missions on

Mr. Haddad: The Shuttle

Dr. Butler: On the Shuttle Still?

Mr. Haddad: Yeah, this was, we were assuming that the Shuttle Centaur was still going to fly. Ok. And so we were proceeding down the path that Shuttle Centaur was still going to be used. Now when it. Now to answer your question, when it got canceled, of course then we, well, what are we going to use for these planetaries? So our aspect was we we were working to get Shuttle-Centaur, we were doing what we had to do on the ground to get it ready for launch and then it was cancelled. And so we said ok, all the work we had done pretty much ended at that point and anything to do with Shuttle-Centaur was then, you know, all the infrastructure and things they had worked on was terminated and they did whatever they do with all that hardware. And so then we decided to focus on well, are we still going to fly the planetaries? Um and the decision was yes we were going to use the IUS, Inertial Upper Stage to do that. So then we go, ok, if you use the IUS, how is that different than the Shuttle-Centaur? So we had this process of how we were going to get Shuttle Centaur ready for launch. That's gone. Ok, well how, what does IUS require? IUS is solids. Ok, so the all the bi-prop work we had to do to get Shuttle Centaur we don't have to do now because the IUS is is a double stage solid. I guess there is some hydrogen in certain components but most of it is just huge solid, solid motors, two solid motors. So that was a big shift. We don't have to do bi-prop now. It's all solid motors there's little servicing to none for the propellant side. Ok, that's good, but then you've got the hazards of the solids always being there, where with Shuttle Centaur you wouldn't load until late, so the hazard of having the bi-prop there wasn't a problem because you did that late, or could do that late. The IUS when it came through the door, the solids were there. It was part of the whole vehicle through the whole assembly integration process so in essence like when we go to stack the satellite on top of the IUS for example Galileo, you know, you've got this two stage solid rocket motor underneath you that could go off at any time. So the hazards were a lot more. We had to change our procedures. We had to change the way we did business. We had to really take into account the idea that these things could go off. So in the buildings, you know we had to have the facilities that they went in. Well if this thing were to go off, would it take out the building? Would it take out a building adjacent to it? That type of thing. So we had to in essence we had to um, oh what's the word I'm looking for? I forgot the term, but there's a term that was used for blast zone as a space ship understanding. So the bottom line is that most of the work is done in the vertical processing facility. It was the most removed from the Kennedy Space Center where if that thing went off, it did the least damage to Kennedy Space Center. It didn't take out three other buildings there were people with hardware in. So that was a big shift. And of course then the operations of of integrating to a solid booster and the whole aspect of processing a vehicle with a solid booster on it and then taking that and putting it in the Shuttle and then integrating that to the Shuttle aspect. So that was, that was part of the big change between the two programs. Now the spacecraft themselves had the same requirements initially, but now, because it's an IUS like for Galileo instead of a

END TAPE 1 SIDE A

Mr. Haddad: Because there was a lot less energy with the IUS, they had to do a number of methods uh uh planetary swing bys, fly bys, planetary fly bys to get the energy to go out to Jupiter. When with, with the Centaur you could just shoop, shoot it to Jupiter. But now with the IUS you can't do that, it doesn't have the energy to get there. Actually for Galileo we launched it away from Jupiter (coughs), excuse me. We launched it towards Venus, we did a flyby of Venus and it was two flybys of earth to get it enough energy to go to Jupiter. So that was a big change. Because now and that's the reason for the seven years instead of the two because we literally didn't have enough energy. It was a smaller booster, so literally we didn't have enough energy to get Galileo there.

Dr. Butler: So you'd use the gravitational pull of these planets to sling shot it around.

Mr. Haddad: Yes, in essence, ok. We, we, there was, there was a whole flight group that did that whole trajectory, where to fly it when and what time. Our job was to get it off in time. Um, because of the planets; they were planetaries, we had a very short window. You either had to launch it in this couple of week's time frame or you can't make Jupiter in seven years. You have to wait literally two years, or I guess to Jupiter it was thirteen months for your next launch attempt. So our job here was to make sure that we got Galileo off the ground in that short time period. We did whatever we had to to get that spacecraft and that booster ready because if we missed that window we had to wait at least another; I think it was actually two years, to launch it. Of course nobody wanted to do that because Galileo itself was on the ground for What, I don't know how long, a decade? However long it was before it finally got a chance to launch. So from our standpoint, even though flight wise it took seven more years it put a lot of pressure on us because we didn't want to wait any longer. And it also required some modification of the spacecraft for flight of Galileo because it was never intention, intentioned to fly it towards the sun. They had to do things to the spacecraft to protect it from the heat and going toward the sun where initially it was designed to go away from it. So then whatever those mods were, we had to to be able to support whatever needed to be done to be able to prepare those mods, service those mods, keep them clean, or whatever. So it was, it was a big change. Again we were on the tail of it, but we would help support some of the redesign because, "well we want to do this modification" but we be from a Kennedy standpoint, and say "that's great but there's no way in Kennedy Space

Center that would help." You need to clean it to that level, service it that way, integrate it, the way the spacecraft's designed you can't get to it. For example, and this didn't happen with Galileo, but this is an example was batteries. Ok we always tried to do when we got initially into design of spacecraft was to have access to the batteries easy right up to the point of launch. Where the people who actually designed the hardware would say "Oh, yeah, we'll put them in a couple of days before launch and then launch. So they had planned on servicing the batteries in final two days before launch. Well, getting access to that hardware at the pad a two days before launch really was impossible. So you'd need to have longer life batteries. And this is one example of how the flight design we would influence the flight design and say one of two things you either get batteries that you could put in months ahead of time or give us a nice access panel so that we could get in there easily and do it a week or so before the launch. So that was just one aspect. Again with Galileo you really didn't have that problem. But for example with Hubble, Hubble's batteries. You know we had to service Hubble's batteries late in the count for launch pad. So that was just one, one example, some, somehow, where a change in design could lead to major changes that we would have to stop. That's why we were involved in listening to the design changes for the payload or whatever.

Dr. Butler: Why don't you tell us a little about Hubble and because I understand that Hubble was probably one of the, one of the projects where, where Kennedy played a major role in, in preparing it for flight?

Mr. Haddad: Ok, my, my involvement with Hubble was was mostly the pad ops for the actual Hubble telescope itself. The operations over in the Vertical Processing Facility I supported because some of the other space reps had gone to the VPF and I knew that facility, I knew what it could do. I understood what Hubble required and so I supported a little bit of the activities at the Vertical Processing Facility preparing it for launch. Now when it went out to the launch pad we got a lot more involved in the battery servicing and the contamination aspect. It was keeping, because of the mirror they had in Hubble; the concern of contamination was large. So I would help, I was assisting with cleaning the VCR, how to keep it clean, monitoring the climate, doing whatever we had to do with everything else going on in there to keep it clean. For example if you had a um, we would notice that maybe there were a number of mechanisms out there that were driven by one meter that had had grease. If some of the grease would come out of the mechanism and fall onto the telescope that was a major disaster. So like putting bags around the gear mechanism, cleaning, black light inspections. A lot of times, one of the inspection techniques we used was we would turn off all the lights in the pad and use a black light because black light would show up little particles that you wouldn't be able to see with regular light. So we supported that, we would support the activity of using the black light, cleaning the little access locations that required where we saw stuff, things like this. How we'd get there we'd help get the people there to clean it. A lot of times Hubble people would be the ones who wanted to do the work themselves because it was their telescope. I mean that was a difference from level IV. When I got out in the planet (coughs) excuse me, the planetaries and that we, at that point we stood back and we supported, we supported the contractors. (clears throat). Excuse me. With some of the GSEs, there was plenty of flight activities we (Unintelligible) Once it was launched, I got assigned to actually be the one who was (Unintelligible) Because of my background in level IV, because of the understanding that what it took to get hardware hooked into space station, they asked me to work (Unintelligible) project and servicing project. That was really interesting and that was a very highly sensitive instrument. Not only from contamination, but from vibration shock. I don't remember all the requirements. It was, it was, it was a very sensitive piece of equipment. So again, our job was to pretty much prepare it, prepare the container, assemble the container, it was assembled on a structure that was flown in Spacelab days. So I had a background with the Spacelab hardware, I knew what it took to configure the Spacelab hardware and I would bring in the carrier piece that would carry it and of course the integration activity. That was my big thing working Hubble and then I, I started on that and then actually got assigned to other things, somebody took the, took the ball and ran with the actual integration of the flight hardware, an of course integration of the actual mission operations. I got out of it by that point. It was a (Unintelligible) that Hubble, Geez. We were out there for the transfer from the Payload Change out Room initially were the hardware would go and then that room had a mechanism which physically moved it from that room into the Shuttle. I remember being out there for that activity for Hubble. It took up the whole (Unintelligible) of Shuttle. (Unintelligible) But it was rewarding because some of the pad ops that we did was decontamination between the battery ops. The cooling support, I worked cooling for the payloads and of course the battery operations for the battery ops. So I would support the battery ops the final activities for the batteries that needed to be tested before launch And then we set in on conferences. It was my (Unintelligible) A lot of people. We'd get in the meetings, normal meetings of fifteen twenty people for normal hardware, normal experiments. With Hubble it was in the hundreds. Every meeting had hundreds of people in it. It was a lot different project. Of course it was successful. Actually it was up at Perkins Elmer, a place where they, they ground the mirror, because they were designing the replacement instrument that would go on the first retro. Kennedy was processing parts for that. I was actually doing the carrier for that, if I remember correctly. So I flew there and I knew the people who were working on grinding the mirror. It was essentially (Unintelligible) fault that of course they had to repair before Hubble could work and all That's my involvement with Hubble.

Dr. Butler: OK, and in the midst of that you transitioned again. Uh, tell us where you went.

Mr. Haddad: Well that was the, that was the transition to the, to the other planetaries, some of the satellite missions that flew. Cause, if I remember right Hubble was STS-31 and Galileo, I think was 34 [STS-34] and then Ulysses I think was 41. So that was that transition where I'd gone from Level IV to the planetary satellites that was one of the activities that I was doing during the transition was Hubble. Yes. That was where I was heading. I was heading over to the planetary tech payloads when I worked that. And that was one of the things where I, I saw the Galileo, Ulysses missions coming up and I and I really wanted to work those so I transitioned and when I transitioned out someone transitioned in behind me to do the work that I started. It was a lot of fun but, again Hubble was going to be there but I saw these planetaries as one shot. There was only one Galileo, of course there's only one Hubble too, but there was only one Galileo and it was going off to Jupiter and I wanted to work that mission. I got involved with the mechanical fluids aspect of that payload propellant (Unintelligible) and some of the other activities of getting Galileo ready for launch. And I wanted to work that spacecraft. I did, I got assigned successfully to the Galileo Mission. It was a lot of fun.

Dr. Butler: It sounds like it.

Mr. Haddad: Hm, hm. I've loved it out here, I wouldn't want to work any place else. And then I got transferred over to, and then from there I saw that (Unintelligible) in space station picking up and I jumped into space station program. Actually I first started working in Space station back in 1987 was my first interaction with space station. Again because there was those of us working on Level IV, they brought us say "You guys have been working experiments for all these years, we've got the next level up. We want you to do something for space station. Help us to figure out how to assemble and test space station and that's why they brought us in to do this stuff. That was one of the things that happened during the Challenger down time

Dr. Butler: Hm hm.

Mr. Haddad: was that I worked a number of different things during that time.

Dr. Butler: So it sounds like the Challenger down time was significant in that they were preparing payloads long term during

Mr. Haddad: Hm hm.

Dr. Butler: that time period

Mr. Haddad: Oh yes sir they're, um, all of the payloads really had a long life before they ever got to Kennedy Space Center. And that was just one of the general things that they were planning for the future that just happened to be a point in time where we could interact, that we could get involved in whatever aspect of that mission.

And again because it was a down time we weren't crankin ahead with all the payload work we were doing to get ready for the next launch we were getting, we were able to get more involved. Where, because we were working experiments early on we couldn't fly out for two weeks, we could only fly out for a day or two. We had to come back because there was only so many of us working all these Shuttle missions, all these Spacelab experiments and that. So in the down time, we were literally in a hold pattern. So we could fly out now for a week, we could stay out there for maybe two weeks; really dig deep into the design of this new spacecraft or this new approach or whatever. The downtime gave us a chance to really dig more deep into these future missions, where if Challenger hadn't happened we wouldn't have gotten nearly the amount of time to spend early on. I think it really helped the payloads in that we were able to focus a lot more and dig a lot deeper and get into the nuts and bolts to give them ideas and suggestions, to give them pitfalls that we'd run into; give that all extra to them early and in a lot more detail. So then they would avoid all those things that we ran into working here at Kennedy Space Center during the assembly of their spacecraft or their experiment. We'd learned so much from all this different hardware that we'd worked on that we could apply it to the planetaries, we could apply it to the observatory type payloads, we could apply it to the satellites even. Um

Dr. Butler: What were some of the lessons that you learned?

Mr. Haddad: Mostly how to get it, how to get hardware through Kennedy Space Center and the type of flight hardware that they were flying. For example some of the mechanical fittings that we were using, we found early on were just they didn't work. They were aircraft standard fittings that were great for aircraft, and could work, but they were a nightmare to get them to work. And so yeah, you'd say well if you get this thing together you realize if you get it together it will last forever. That's true, but getting it together and stopping leaks it was a nightmare. So if you want to spend a lot of money fixing these leaks when you get here to Kennedy Space Center use these fittings. If you don't, you want to spend a little bit more money up front and have a nice smooth transition from your fluid is not leaking; this is the hardware you should use. So that's just, that's just one example of how things that we, we'd learned we could apply to any spacecraft you can use all these type of fittings on there you will, you know, we had four or five missions we had those same type of fittings. Please avoid those fittings and it will save you a lot of headache down here. And they did. Or for example, they would require a special gas. I'd say that's fine but we don't have the hardware here and the support service in your experiment to have that kind of gas. We'd run into, if you use this kind of gas, these are the problems we'd run into servicing this experiment, certain pressures there's a contamination factor. So yeah, you can maybe you can get your spacecraft and scientific experiment approved to use this type of gas but these are the problems that go with that. Does that make sense?

Dr. Butler: Hm hm.

Mr. Haddad: Does that make sense to anyone? So that would be different. You know, one or two things maybe. Again with our job we were I remember I would say literally making dozens, if not more than dozens of decisions every day; every day making decisions one way or the other on on on how to proceed. You had to really make the right decisions most of the time because if you didn't it cost money, it cost the experiment, it cost time, you could even miss the mission. If you made a bad decision that rippled through everything else and really screwed things up. So I remember making dozens of decisions every day. What would be the best course to go with this piece of hardware or with this process or, you know, maybe servicing this experiment this way or supporting the, supporting a test for example? If you didn't want to make decisions, you didn't take the job we were doing, cause it, cause it was a decision job. You had to make decisions every day and hope that, you know, not all of the decisions were right, that's a given. We didn't make the right decision every time but we did ok. We made a lot of right decisions and the ones that we didn't make the right decisions we learned from, which was good, because we learned not to do that again. And we applied that to future, future elements and so, but every mission was unique. Even when you flew a space lab it could be seventy totally totally different experiments. So just because you had flown an experiment that came from Germany on Spacelab 1, an experiment that came up from Germany for German Spacelab D1 was totally totally different. Every experiment was different, every experiment was new. Every one had their own unique requirements, had their own unique assembly sequence, had their own unique servicing sequence, had their own unique testing sequence. So every one was new. So again as you worked more and more missions we had more and more of a knowledge base of all the hardware that worked.

Dr. Butler: Hm hm.

Mr. Haddad: And we had a lot of fun. We had a lot of fun. And it helped our future. Helped us avoid other pitfalls, you know.

Dr. Butler: Can you tell us a mistake that Kennedy made that, that they learned a great deal from?

Mr. Haddad: Hm. Let's see. Well. I don't know if it was actually a mistake that you know, Kennedy made, I can't say. I know there was some involved in the early planning of some of the activities that, I don't know if you ever heard the term ship and shoot.

Dr. Butler: Hm hm.

Mr. Haddad: Ok, we always thought that was a bad idea. We thought that there was a need for integrated testing just because you constructed this piece in Germany and this piece at the University of Wisconsin and this piece down in Brazil and all of them separate worked fine but when you brought them together that they would work fine. We never thought that. There were people at Kennedy that thought ship and shoot worked, there weren't many but there were some. And we felt that was invalid, the people that were here questioned that concept. A lot of times it came from off site. People off site, "we don't need to, we don't need to do that at Kennedy. We're going to send it right to the launch pad and launch it in shuttle. We don't need any integration, we don't need to test it. We just need to ship and shoot." We always fought that. And there were some here, not many but there were some that agreed with that. (Unintelligible) Um, I guess the other thing that was in the beginning, the customer support, getting, getting involved earlier, um, was a problem. But I feel, I felt for the managers at that time because we were dealing with so many people and we couldn't be flying people all over the world when we still had hardware here to process and test and things like that. And so there were times when we decided not send this and we got bit for it. They would come to Kennedy and I may have been on a trip, I may have seen that eight months ago, it may have been a year or more. Sorry, I didn't see that in the paperwork, but again, I think at the time there was no one available. But we learned, we learned and I think that's what we tried to do when we were planning the space station program. And we're still trying to plan that today because people who've worked there on space station get involved earlier in the design of new space station components so we get that same influence. You know we pretty much the buck stops here if we don't do it now it doesn't fly. So to do whatever we can from ground support here at Kennedy Space Center to the design of a flight element, to help that support to get them off the ground. We have a continued interest in its success. Those who told us that once its launched you guys don't care about it, that was dead wrong, that was absolutely dead wrong. Well you don't have anything to worry about after that. No sir, because we work years on some of this hardware to get it ready for launch and we supported the mission as well, so its not the last thing we really really care about that launch. Because after working with some of that stuff for years you want to see it successful. Our whole job was in vain if you spent that two years working on it and it, and it didn't work on orbit, well why even fly it? Now again some of these experiments we understood and I hate it, I shouldn't say I hate it, I take that back. I didn't like the way we would portray a failure on orbit. Some of these science experiments didn't work on orbit; these were scientists trying to understand, trying to make something work on orbit and it didn't work the way he thought. Now is that a failure? We thought no, he learned that the concept he had wouldn't work on orbit, wouldn't work in microgravity, wouldn't work in the vacuum of space. And so he learned something. So yeah, while the mission didn't work like it was supposed to it wasn't a failure because he learned something. But they always "Oh but you've had seventy experiments but only sixty-five were successful, the other five failed." No, the other five you learned that you can't do that kind of work the way they wanted to in space. They always tell me it was a failure; they always tried to say, well what's your goal, you guys are trying to run one hundred twenty-six different samples with this experiment, you only ran a hundred so it was a failure because you didn't meet your goal. No, no, it's just that we ran these other samples until we started to learn something so we extended the sample beyond the time period and so we had to chop the one at the end off. Something like that. So we were really sensitive that they worked on orbit eve though Houston or other areas were responsible for the actual flight operations, we were right beside them supporting where if they had a problem on orbit, we could, "oh yeah, we saw that on the ground. During tests, yeah we saw that. Hit this button, send this command or, you know, dropped the pressure fifty PSI, that thing will reseal itself and then you bring the pressure back up and it will be fine the rest of the flight, stuff like that. And so no, we really, we didn't like the fact that everyone thought that our job was over at launch, it wasn't by far, it wasn't at all. Sorry, I got on a soap box on this one. (both talking)

Dr. Butler No, that's an interesting different issue from, say, the launch people where once it lifts off their job is over, so that is a different aspect of Kennedy.

Mr. Haddad Right, that is, and that's why there's a whole Shuttle story that's a big very successful story, but there's also this payloads story. It's the other half of what's happened at Kennedy Space Center over the last, well since the Shuttle did start flying. There's a whole payload history that really needs the shuttle, I thought from the Payload side, but I thought really made the Shuttle Program successful. The Shuttle was flying successfully, but what flew in it? The stuff that flew caused it to be successful most of the time. That was half the history. That's why I'm so glad that you all are telling the story because there's a lot of people have never heard that part. There's a lot of people who've never heard of payloads, never heard of experiment integration, never heard of Level IV, just thought the Shuttle launched. It did and that's what you saw and that's what the people saw on TV all the time. Well why were we flying the Shuttle, well for the heart of the crew members, the astronauts that work on the payload bay their responsibilities to run experiments for a few seconds, that whole payload half of the program that made the Shuttle successful and what the people did here to pull that off. You know, as I said before, a lot of people sacrificed a lot. I mean I was single at the time, I didn't care, but here there was a lot of married people and their families suffered for them to accomplish the goal of seeing people fly these scientist's experiments. There were a number of divorces. There were a number of marriages too because we were spending so much time together that there were a number of people that worked together ended getting married and they're still married today a number of them. Because we were so tight at the time working so close together. And we did a lot of other stuff too, we played real hard, we worked real hard and we played real hard. We all became closest friends, we went on ski trips, all of us are certified in scuba diving, we'd go down to the Keys and go scuba diving or whatever. We would go to the Daytona races together. We just, we worked together and we played together. They were my friends. Even though a number of them have left and gone to other centers, some of them have left NASA all together, we still keep in touch with each other, there was a closeness among friends infrom that Level IV Experiment Integration. (Unintelligible)

Dr. Butler Now when you deal with Space Station and the Payloads for Space Station, how were payloads for space station different from the earlier group of payloads?

Mr. Haddad Um

Dr. Butler And how are they alike?

Mr. Haddad I think that they, there's, they are a lot alike in the aspect of the kind of science that they wanted to do and the kind of things we needed to do on the ground to get them ready for launch. The difference being of course for the payloads we worked on, they were short term. You know when you flew on Shuttle some of these missions would last ten, fourteen, I think the longest was sixteen days. Of course on, on Station they're up there for months and so that aspect of the experiments having to survive and having to operate a lot longer on orbit compared to what we used to fly on Spacelab and middeck, that's a big difference. They're up there for months now, instead of weeks.

Dr. Butler How does that affect payload ground operations processing?

Mr. Haddad Um For some of the, some of the things we would work on, I think I'd go back to leaks for example, there were times we flew with a leak. We couldn't stop them from leaking. But we knew that it was only a sixteen week, sixteen day mission and so we knew it would be back in just over two weeks, we understood the rate of the leak from that so we knew it would be, it would have enough to survive the flight. Station you don't have that, if its up there for four months with that same kind of leak, it's, it's, it's gone, the experiments gone so we would have to take more care in understanding the long term pieces of hardware. Of course the hardware would come back, let's take the MPLM, um there was things that would happen on orbit, especially on MPLM where we would pull hardware out and stick different hardware in. You know in the Shuttle and Spacelab if you pulled anything out usually you more than likely to go back in where it started. You'd take it out and put it back in, the same piece of hardware. For Station its different, it could be the same it could be where you t leave something or it could go back in orbit in MPLM.

Dr. Butler MPLM stands for?

Mr. Haddad Multi-Pressurized Logistics Module.

Dr. Butler ok

Mr. Haddad So with this hardware coming back being different than what went up, you this is what you, you know, in the Spacelab days you planned, this is the hardware going up and this is the hardware coming back. And so in essence it's a reverse process of what we did going up. For MPL, for the MPLM Missions you could have one set of hardware going up and a totally different set of hardware coming back, which means your whole post flight activity is totally different. Maybe the handling of the sample is a lot more critical than the one of a difficult, a different sample that went up. Maybe this one's got fluid in it the other one didn't have anything in it. So that aspect is a big change in that what's coming back isn't always what went up. So that's probably one of the biggest changes down here is being able to prepare for a longer term mission and then realizing that what's coming back is different from what went up there on the initial mission. It could have gone up years ago, maybe three years ago, ok, and now it's coming back now, so you have to maintain a history base, well what happened during the three years and now be able to reverse it on the post flight. So those are two big ones I can think of off hand. Those are differences, big differences going up there and down here on the ground.

Dr. Butler Now is is payloads involved in the preparation of components for for Space Station and the construction of Space Station?

Mr. Haddad Yes sir there were a number of us, um because of our work in Spacelab, we got, we got pulled into, at the time was a new group under Tip Talone. We, the space station initially the concept was almost like a ship and shoot concept. Even though, here at Kennedy we prepared for a test and launch concept. And so bottom-line is we NASA was hands off until the hardware almost arrived at Kennedy. So we'd take this thing and we'd launch it. But we found that there was things that were going on back there that we felt we needed to be more involved with and eventually, again this is just my, my view of the world, is Mr. Abbey who was in charge at the time saw that "I want NASA more involved earlier in Space Station." So he, he came down and said we need to get this group, we need to form a group at Kennedy, I don't know if he personally picked Tip or not, but for Tip to form this organization that would then go out in the field where all this Space Station hardware was being built, using that corporate knowledge of all those years of experience doing Spacelab and apply that to Space Station. So that's what we did. I got picked up. A number of us from, that got picked up to work in Tip's group to take that experience and apply it to the Space Station (Unintelligible). And then of course, test it. We really fought to do down here what was called Multi-Element Integrated Testing. It's in essence it's cabling Space Station elements together instead of just taking one element, testing it, launching it, take another element, testing it, launching it; take a third element, testing it, launching it; we'd bring a number of space station elements down here in the Space Station Processing Facility where we would bring them together, not physically because we couldn't get them physically mated together, but usually electrically and fluid wise we would run jumpers between the elements and we'd power up and say, ok, this is what it's supposed to do on orbit, let's follow the sequence of events and see if it works. And we found a lot of problems. We pushed, we pushed for the program to accept it and it finally did, When we tested we found some really big problems during our ground testing. If you would have tried to fly those elements it would never, it wouldn't have worked on orbit. And so that was another aspect of us getting involved in Space Station, helping that initial concept and also taking our corporate knowledge that says testing is so important and really driving that concept home so finally the Program accepted it. And now we've had three, three MEITs that have been very successful. So that's the upfront and the ones that got here, the hardware to Kennedy that's how the knowledge base was used to (Unintelligible) Its still doing this today. That's one of the activities I'm working on right now is MEIT IV which is the node 2 element with the piece of Columbus module at this point. Um initially node 2 was supposed supposed to launch and then Columbus was going to be coming a year or two after that. Well after Columbia, node 2 is still on the ground but its my understanding that the Columbus module is still on schedule, the bottom line is that Columbus and the node right now will be in the building at physically the same time. So I'm working on the, well not just myself, but I'm looking at the activities that are going on for MEIT 4 right now. Say, we've been successful for the first three, looks like Columbus is going to be here Columbus is a European Control Module. That's going to be here the same time as node 2, what do we have to do to get (Unintelligible). So that's the activity that's happening today, as a matter of fact I'm going to try and finish my report in the next couple of days. So it just hasn't happened in the past, its happening today, and of course in the future. I'll mention that we're hoping that whatever the course for Kennedy Space Center in the future is it will continue to help, help that aspect of flight design and ground processing.

Dr. Butler So it sounds to me that one, in your mind anyway, one of the crucial lessons learned here at Kennedy has been the importance of project integration

Mr. Haddad yes

Dr. Butler versus the ship and shoot model

Mr. Haddad Yes. Absolutely. Absolutely. Time and time again it's proven to be really, this activity, testing has been successful and for whatever reason ship and shoot concepts continues to come up. In fact, and I'll say this, I've said this to a number of people, and I'll say this on tape. When I've heard about the concept, lead concepts that we're planning for the future for NASA (Unintelligible) be involved in, I actually sent a message to Mr. Kennedy, our Center Director, cause he's, he'll be involved, he'll have people involved in this a lot more than I'll ever see myself that just to avoid that concept of ship and shoot. If they ever bring up that concept to please say, well we've heard that concept before and when its been done in the programs in the past it hasn't worked so we don't want to take that approach for the future. Now again they may decide to do that, that's fine, but at least he's got that and I wanted to put it in the back of his mind that here's that concept and we have to have a good reason to want to try it. Why we would want to do a ship and shoot concept for whatever reason. Cause history shows that the integrated part works; if you did do a ship and shoot it won't work. (laughter) So that's what I wrote.

Dr. Butler Any other issues that you can think of that come out of your experience here at Kennedy?

Mr. Haddad No, not really. I think um having, having the organizations that are outside Kennedy understand what the people here at Kennedy can do for them, um is valuable. For some its still "Oh well, I think that maybe our involvement is only once it comes to Kennedy, but then how do you do this experiment that's (Unintelligible) and even at that point you sort of look, can harm the mission if it flies at all. I think trying to help the people that are on the outside understand that we can do more than that, more than just put it in the Shuttle and launch it; put it in the space station and launch it. We can help process it and we do launch it.. Something that I'm hoping will (Unintelligible). Part of this is a culture change and part of it is communications, increased communications would be helpful, communications with the other centers would be better and we'd learn more if we could help the other centers (Unintelligible).

Dr. Butler Crucial people we ought to talk to?

Mr. Haddad On payloads? I've got a few.

Dr. Butler Sure.

Mr. Haddad Scott Vangen.

Dr. Butler How do you spell the last name

Mr. Haddad V-A-N-G-E-N. Scott in essence was, he's been a friend of mine for over twenty years. He's my electrical counterpart. What I did mechanically, Scotts done from the electrical side. Um Scott's real bright. He's been so involved and made such a contribution to (Unintelligible) that he actually got picked as an alternate astronaut for the Astro series of missions. He was a back up payloads specialist. If one of the primary payload specialists had not flown or got sick, Scott would have flown instead. He's critical. He is corporate knowledge. He's one of the ones who's been here from the beginning from the electrical side. He'll tell you (Unintelligible) stories from the electrical side how payloads, how the people who work payloads can shape the (Unintelligible) and continue on the Space Station program. He's critical Scott Vangen. Um, from a management standpoint I would say Enoch Moser. I don't know how to spell that. Its M-O-S-H-E-R. I'd have to look it up. Yeah, I know him personally. He's been here from the beginning. He has more of a, he's very technical. He has more of a management view of how things get accomplished, how we're able to pull things off from a management point. I don't know if you still want people who have been retired but Bill Jule. You've heard the name Bill Jule. He doesn't work, he's NASA retiree. He still lives in the area. In fact I've got his email and got his address. He was the one, he was in essence was the God father of Level IV. I think of him, he was the one who pushed the concept, made, he was the one who brought the concept to Kennedy Space Center. If it wasn't for Bill, none of this would have happened. He's another one that's critical. He'll tell you again from the up side out what he had to do from a payload (Unintelligible) I can send you and email message with about half a dozen other people

Dr. Butler We'd appreciate that and I'm not sure we'd get the time to talk to them all

Mr. Haddad Ok

Dr. Butler but the more people we know about the better off we are.

Mr. Haddad One person I think you may have already interviewed is Virginia Whitehead.

Dr. Butler Yeah, I know she's been interviewed. I wasn't in on that interview though.

Mr. Haddad I had done an interview for her over at the Oral History Project. She is the most amazing, out of anybody that's worked out here. Eighty years old and she's pretty much (Unintelligible). She's been at Kennedy for a long time. She worked with Von Braun and Debus at White Sands, so she's, she's got a whole lot of history of NASA in general. But, she pulled things off at Kennedy Space Center that are unbelievable (Unintelligible). I mean she was the one that created the first tailored operations control center and that in essence was for one of the German payloads that flew on the Shuttle they literally instead of trying to control it from Germany, she set up a control center here, because all the preflight stuff was here and once you launched trying to ship everybody and all that boxed to German and bring everybody back for post flight she actually was responsible for creating a control center where the Germans managed their mission.. They did their preflight, they did their launch activity, they commanded the spacecraft from here at Kennedy Space Center at that control center site and of course they did all their post flight stuff. She literally was the first one to do that. And that's just one, one thing this woman has done. So Virginia Whitehead is another person that would be very helpful. Her knowledge, would be very helpful, with all the things she's done during her time at Kennedy Space Center. I mean she's been here from the beginning would be very helpful and I think most of her work has been on the payload side. The customer side, she's been a very big advocate of the customer, the customer. I can send you an email

Dr. Butler OK

Mr. Haddad I'll send the rest in an email

Dr. Butler I'd appreciate that.

Mr. Haddad Anyway, I've got a number of other names in my head but I'll just send them to you in an email and I think Again, try and get the gamut of mechanical engineering, electrical engineering, management, operations, safety, There's another gentleman, John Dolberg (phonetic) that's been the guru of safety. John himself has been a person that, and there's probably been multiple other persons who've done the things John has but he was so critical to making a number of payloads safe as well as successful, that people here at Kennedy saved single handedly, he's probably one of them. I personally think he's the best Safety guy at Kennedy, John Dolberg, then we've got other ELV people that I'm not as familiar with.

Dr. Butler Sounds good.

Mr. Haddad I think it would be critical to help, help make your book a complete package from the payload standpoint. I'm just one example, there are many more people out there that made the payload story.

Dr. Butler I think you for taking the time.

Mr. Haddad Your welcome

Dr. Butler We appreciate your taking the time and letting us know at least your, what you know. It it it'll help us understand better some of the issues.

Mr. Haddad Anything else I can help with in the future. I'll, You know I'm just a phone call away and I can come whenever I work Kennedy. Thank you for the time.

Dr. Butler Hm hm.